



Stitch in Time: Bariatric Surgery as an Investment for the Future

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Type 2 diabetes (T2D) affects ~1 in 10 adults in the U.S., 90% of whom have overweight or obesity (1). This has huge economic implications: the direct costs of treating T2D in the U.S. surpass \$200 billion annually. It is clear that bariatric surgery provides clinical benefits for people with obesity and T2D (2). It reduces body mass, increases life expectancy, decreases medication burden, and improves health-related quality of life (3,4). Global uptake of bariatric surgery in people with obesity and T2D is, however, very low: most countries treat <1% of eligible patients annually (5). A major contributor to this situation is the high one-off cost of surgery, combined with limited data on expected return on investment. In this issue of *Diabetes Care*, Sloan et al. (6) analyze the effect of bariatric surgery on health care expenditure in the post-surgical period.

Previous economic evaluations of bariatric surgery for people with obesity and T2D have had conflicting results. Empirical studies from the U.S. and Sweden have reported comparable total health care expenditure postsurgery compared with nonsurgical treatment (7,8). In the U.K., bariatric surgery has been reported to reduce health care expenditure in the postsurgical period (9), whereas a Canadian analysis reported higher expenditure in patients following Roux-en-Y-gastric bypass (RYGB) compared with control individuals for the first 3 years after surgery (10). Differences are unsurprising, since these analyses have highly variable contexts:

different health care systems, populations with differing health status, different study types (randomized control trial participants or registry data), and different time periods. The latter is especially pertinent given the rapidly evolving landscape for medications for T2D and obesity, many of which are much more expensive (but also potentially much more effective) than previous alternatives.

For the current study, Sloan et al. identified a cohort of 6,690 patients with BMI >35 kg/m² and T2D undergoing surgery by two providers in the Western and Northwestern U.S. over 8 years from 1 January 2012. They compared this cohort to a group of nearly 15,000 individuals from the electronic health record, matched on factors including region, demographic variables, BMI, and T2D severity. The major finding of the study is that estimated total expenditure for surgical patients declined by 28% following surgery, which equates to a savings of ~\$1,000 per 6-month period. This finding was true at 12 months postsurgery and through 5.5 years of follow-up. In the latter period, surgical patients had an expenditure ~\$500–800 lower than nonsurgical control individuals per 6-month period. The reduction in costs was primarily driven by a drop in medication expenses for surgical patients, which was only partially offset by higher inpatient use.

This study benefitted from real-world, empirical data and a very large cohort. The finding that medication costs decrease following bariatric surgery in people with

obesity and T2D is highly plausible given the robust clinical evidence that bariatric surgery results in resolution or improvement of T2D, with a reduction in medication use (11,12). The extent to which medication costs decrease, however, depends in large part on the health care system, and it is worth remembering that medication costs are vastly inflated in the U.S. compared with most other countries (13).

A key limitation of the study is that the cost of the index admission for the bariatric surgery itself was not included: this has been estimated by the authors at \$16,000–17,000 (14). Given the modest reductions in total health care expenditures reported postsurgery, surgery is highly unlikely to be cost-saving in this cohort over the time period studied. Having said this, over 5 years postsurgery, the trajectory of health care expenditure appears to be stable, suggesting that the reductions observed persist over a longer time period. An important area for future work will be to extend the time horizon to parallel the clinical studies now available that demonstrate clinical benefits for 10–15 years after surgery (15,16). Economic simulations that have incorporated the cost of surgery have predicted that surgery can be cost-saving over the medium- to long-term for people with obesity and T2D, with the caveat that these were performed in the U.K. and Europe, where the cost of surgery is much lower (17,18).

A further limitation of the current study is that there is no breakdown available for

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the reduction in medication costs or health care use. More detailed analysis of the breakdown of costs would be helpful to interpret and address causes for the differences seen: for example, was the observed reduction in medication costs postsurgery due to a reduction in medications for T2D or for other conditions? Were the inpatient admissions postsurgery related to complications of surgery or for complications of T2D?

In a related study, the authors have performed a further analysis of the same surgical cohort to compare health care expenditure following the two most prevalent types of primary bariatric surgery in the U.S., sleeve gastrectomy (SG) and RYGB (19). They demonstrate comparable total expenditures after the two operations, with a transiently higher expenditure for RYGB in the first 6 months postsurgery. This is interesting, as most (20,21), but not all (22), studies demonstrate marginally better clinical outcomes with RYGB compared with SG. The equivalence of cost could be explained by a trade-off whereby SG may confer inferior weight loss but has a better longer-term safety profile (23). Again, more detailed decomposition of health care costs, in both the short- and long-term, would help to interpret these findings.

Although the groups were reasonably well-matched, the surgical cohort had a slightly higher HbA_{1c} at baseline (7.7% vs. 7.1%), and there will also have been unobserved confounding related to the choice of surgery versus nonsurgical management. The results presented are unlikely to be generalizable to the real-world population of people undergoing bariatric surgery, most of whom do not have T2D (24). To help guide resource allocation most effectively, further work would examine the cost implications of performing surgery in people with obesity both with and without T2D and with different severities of T2D.

Finally, it is notable that <2% of participants in the current study were on a glucagon-like peptide 1 receptor agonist at baseline. As glucagon-like peptide 1 receptor agonist use soars (25), it will be important to compare long-term use of these medications with bariatric surgery. The findings of such analyses will be fascinating and are difficult to predict: the cost of such medications is high but likely to decrease over time, while their weight-loss potential is so profound that they

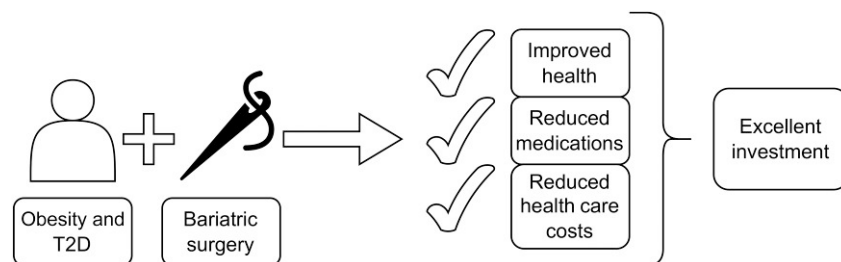


Figure 1—Benefits of bariatric surgery in people with obesity and T2D.

may significantly reduce the complications associated with obesity and T2D. The current study corroborates an extensive body of work confirming that bariatric surgery reduces weight, improves comorbidities, and reduces medication burden. Although this study is typical in including only direct health care costs, there are of course also vast but difficult-to-measure indirect economic and social benefits of bariatric surgery, including return to work (26). We do not lack evidence to justify greater uptake of bariatric surgery for people living with obesity and T2D. Whether bariatric surgery is overall cost-saving may depend on the health care context, but what is not in doubt is that it is an investment in good health (Fig. 1).

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